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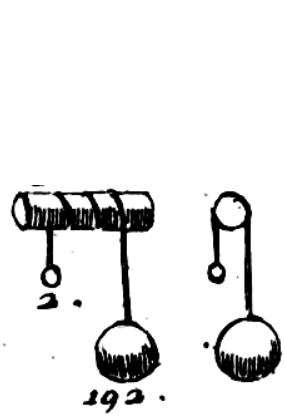
Seminar des Instituts für Mechanik

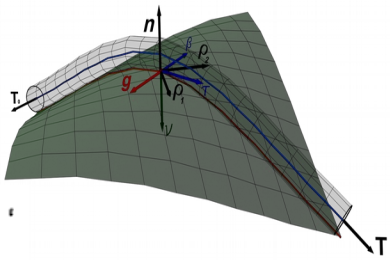
Referent: **PD KIT, Prof. KNRTU, Dr. habil. Alexander Konyukhov**
Institut für Mechanik, KIT
Datum: Dienstag, 19.12.2017
Uhrzeit: 14:00 - 15:30 Uhr
Ort: Seminarraum des IfM (Geb. 10.30, EG)

Thema: **Generalization of the Euler-Eytelwein problem for orthotropic surfaces of arbitrary geometry**

Abstract
Mechanics of 1D geometrical manifolds such as curves has attracted a lot of researchers since many years. Depending on mechanical properties, a curve can represent either a beam model, or a rope model. A curvilinear beam model, known as Euler Elastica originally published in 1744, has been developed in various aspects through numerous publications. Another problem is the definition of frictional forces in a rope sliding over a cylinder. The solution of this problem was reported by Euler in 1769 [1] and became known later as Euler-Eytelwein formula [2]. Though, the problem has many engineering aspects, there are only a few publications and developments devoted to this famous problem.

The current work is proposing the consistent theory for contact between ropes and orthotropic rough surfaces based on the recent understanding of contact as the geometrical interaction between various objects (surfaces and curves) inherited with certain mechanical properties (various interface laws).





Surprisingly, closed forms solutions are still possible – several cases are discussed in detail including the criteria of static equilibrium, – and the famous Euler-Eytelwein formula $T = T_0 e^{\mu\phi}$ for tensile forces in the rope wrapped around the cylinder is recovered. **The current result is representing the generalization of the famous Euler-Eytelwein formula from 1769!.** In addition, the theorem – **The equilibrium curve on a rough surface under maximum tensile load is a geodesic** – is easily resulting as an outcome of the developed theory.

1. *Euler L., Remarques sur l'effet du frottement dans l'equilibre, Memoires de l'academie des sciences de Berlin, 18, 1769, pp. 265–278.*
2. *Eytelwein J. A., 1808. Handbuch der Statik fester Körper. Mit vorzüglicher Rücksicht auf ihre Anwendung in der Architektur. Vol. 2, Berlin, pp. 21–23.*
3. *Konyukhov A. Contact of ropes and orthotropic rough surfaces. Zeitschrift für Angewandte Mathematik und Mechanik. Vol. 95 (4), 2015, 406 – 423.*

Alle Interessenten sind herzlich eingeladen.